



ABSTRACT / ZUSAMMENFASSUNG / ABREGE

97112763.4

There is disclosed a method of forming stress-adjusted insulating films which are interposed between respective interconnection layers upon laminating metal interconnection layers in excess of three-layer can be obtained by depositing on a substrate (21) alternately insulating films (23a to 23d) having a tensile stress and insulating films (22a to 22e) having a compressing stress.





✉ EPA/EPO/OEB  
D-80298 München  
☎ +49 89 2399-0  
TX 523 656 epmu d  
FAX +49 89 2399-4465

Europäisches  
Patentamt

Generaldirektion 2

European  
Patent Office

Directorate General 2

Office européen  
des brevets

Direction Générale 2

Schwabe - Sandmair - Marx  
Stuntzstrasse 16  
81677 München  
ALLEMAGNE

Telephone Numbers:

Primary Examiner (+49-89) 2399-2279  
(substantive examination)

Formalities Officer / Assistant (+49-89) 2399-2231  
(Formalities and other matters)



Application No. 97 112 763.4-2203	Ref. 52 431 X	Date 04.05.99
Applicant CANON SALES CO., INC. et al.		

**Communication pursuant to Article 96(2) and Rule 51(2) EPC**

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(1) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

**of 4 months**

from the notification of this communication, this period being computed in accordance with Rules 78(3) and 83(2) and (4) EPC.

Amendments to the description, claims and drawings are to be filed where appropriate within the said period in **three copies** on separate sheets (Rule 36(1) EPC).

**Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Article 96(3) EPC).**



VON STASZEWSKI G  
Examiner  
Examining Division

Re(s): 4 page/s reasons (Form 2906)  
Chemical Vapor Deposition for Microelectronics; EP0470632; EP0270231





Bescheid/Protokoll (Anlage)

Communication/Minutes (Annex)

Notification/Procès-verbal (Annexe)

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Anmelde-Nr.:  
Application No.:  
Demande n°: 97 112 763.4

The examination is being carried out on the following application documents:

Text for the Contracting States:

AT BE CH LI DE DK ES FI FR GB GR IE IT LU MC NL PT SE

**Description, pages:**

1-12 as originally filed

**Claims, No.:**

1-12	as received on	18.09.1998	with letter of	18.09.1998
13,14	as received on	23.09.1998	with letter of	23.09.1998

**Drawings, sheets:**

1/12-12/12 as originally filed

1. Claim 11 includes all the features of claim 1. Hence, claim 11 should be re-formulated as a claim dependent on claim 1, cf. Rule 29(4) EPC and the Guidelines C-III, 3.5. Indeed, the substrate defined in claim 1 may comprise an interconnection layer.

Hence, claims 1 and 11 are not allowable.

2. Claim 14 intends to define a device by manufacture process steps. This formulation is not clear, contrary to Article 84 EPC, for the following reasons:

-firstly, a device should be defined by its structural features, independently of the process used to obtain said structure;

secondly, it is not possible to distinguish a device formed according to the process defined by claim 14 from others devices obtained using different process

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steps.

Therefore, claim 14 is not allowable.

3. The following documents (D) are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: EP-A-0 307 099

D2: US-A-5 500 312

The following documents are cited from the examiner's own knowledge (see Guidelines, C-VI, 8.9). Copies of the documents are annexed to the communication: the numbering will be adhered to in the rest of the procedure:

D3: Chemical Vapor Deposition for Microelectronics, by A. Sherman, Noyes Publications, USA, Chapter: Thermal CVD of Dielectrics and Semiconductors.

D4: EP-A-0 470 632

D5: EP-A-0 270 231

4. From D1 (cf. columns 3-5 and figures 5a-e) there is known a stress-adjusted insulating film forming method, wherein (using the wording of claim 1):

"an insulating film (411) having a tensile stress and an insulating film (412) having compressive stress are alternately deposited on a substrate (1,2) to form said stress-adjusted insulating film consisting of said laminated insulating films; characterised in that:  
said insulating film (411) having tensile stress is deposited by reacting a gas mixture by virtue of heating".

The method according to claim 1 is distinguished from the prior art according to D1 by the following feature:



- the gas mixture includes organic silane and oxygen.

Hence, starting from the closest prior art according to D1 the objective problem (see Guidelines C-IV, 9.5) underlying claim 1 reduces to the technical aim of selecting a gas mixture among the conventional ones.

No contribution to inventive step is to be found in the definition of the above problem, as is explained below.

The distinguishing feature above is known from D3. In fact, the text-book D3 (cf. pages 66-77) describes the conventional gas mixtures used to deposit insulating films by reacting said gas mixtures by virtue of heating. The described gas mixtures only comprise (i) inorganic silane and  $O_2$  or  $N_2O$  (cf. D3, pages 66-74), and (ii) organic silane and  $O_2$  (cf D3, pages 74-77).

The simple selection of one of the two conventional alternatives i) or ii) cannot support inventive step (see, Guidelines C-IV, 9.8, C1, i) since such a selection falls within the competence of the skilled person. In the present case, however, an average practitioner would be induced to select the mixture comprising organic silane due its several advantages like good step coverage and non-toxicity (cf. D3, page 74).

In consequence, to arrive at the subject-matter of claim 1 the skilled person only has to use the gas mixture known from D3 (cf. page 74) in the process known from D1. The selection of the second alternative would be obvious to any average practitioner.

Therefore, claim does not meet the requirements of Articles 52(1) and 56 EPC.

5. For the same reasons given in paragraph 4 above, the subject-matter of claims 11 and 12 does not meet the requirements of Articles 52(1) and 56 EPC.

Therefore, claim 12 is not allowable.

6. Dependent claims 2-10 and 13-14 do not appear to contain any additional features



which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to novelty and inventive step, the reasons being as follows:

The features of claim 2 are suggested in D2 (cf. column 5). In fact, the stress ( $\sigma$  in dyne/cm) in an overall stress-adjusted insulating film is given by the equation (2) in D2. If the stress due to surface energy ( $\gamma$ ) is neglected in said formula, the equation defined in claim 2 is obtained.

The magnitude of the stress defined in claim 3 can be established by routine tests in accordance with the circumstances.

The features of claim 4 are known from D1 (cf. column 5).

The features of claims 5 and 9 are known from D3 (cf. page 74).

The features of claim 6 are known from D4 (cf. page 4).

The features of claim 7 are known from D1 (cf. abstract).

Depositing insulating films using an organic silane selected from the group according to claim 8 is known from D5 (cf. page 5).

The features of claim 10 are known from D1 (cf. figure 6).

The features of claim 13 is known from D1.

7. The primary examiner is of the preliminary opinion that at least some of the objections raised above are such that there appears to be no possibility of overcoming them by amendment. Furthermore, the description contains no further technical features on which a patentable claim might be based. It would therefore appear that the application should be refused under Article 97(1) EPC.